

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A process for the separation of cobalt and/or manganese from impurity elements selected from one or more of calcium and magnesium contained in a leach solution, or for separating cobalt from manganese contained in a leach solution, the process comprising the step of subjecting the leach solution to solvent extraction using an organic solution of a carboxylic acid and a hydroxyoxime.
- 10 2. The process of claim 1 wherein the organic solution comprises a stabilizer against hydroxyoxime degradation.
- 15 3. The process of claim 2, wherein the stabilizer is an antioxidant.
4. The process of claim 2, wherein the stabilizer is an alkylphenol.
- 20 5. The process of any one of claims 1 to 4, wherein the leach solution contains little nickel.
6. The process of any one of claims 1 to 5, wherein the leach solution contains cobalt and/or manganese, together with impurity elements selected from one or more of calcium, magnesium, (manganese) and chloride, optionally together with copper and/or zinc.
- 25 7. The process of any one of claims 1 to 6 wherein, the leach solution contains the following levels of elements:

Ni: 0 - 100 ppm
Co: 100 ppm - 5 g/L
Cu: 0 - 100 ppm
35 Zn: 0.2 - 2 g/L
Ca: 1ppm - saturated
Mn: 0.2 - 50 g/L

Mg: 1ppm - 100 g/L

8. The process of any one of claims 1 to 7, wherein the leach solution is a solution that has been subjected to a preliminary iron and/or aluminium precipitation step to precipitate out iron and/or aluminium to leave an aqueous leach solution containing the target elements and impurity elements.
- 10 9. The process of any one of claims 1 to 8, wherein the carboxylic acid is 2-methyl, 2-ethyl heptanoic acid or a cationic exchange extractant having extraction characteristics similar to 2-methyl, 2-ethyl heptanoic acid.
- 15 10. The process of any one of claims 1 to 9, wherein the hydroxyoxime is a chelating α -hydroxyoxime.
- 20 11. The process of any one of claims 1 to 10, wherein the leach solution contains cobalt and manganese, and the pH of the aqueous phase in the solvent extraction step is maintained in the range of from 5.5 to 7.0 to effect extraction of the cobalt and manganese into the organic phase.
- 25 12. The process of claim 11, wherein the pH of the aqueous phase in the solvent extraction step is maintained in the range of from 5.8 to 6.3.
- 30 13. The process of claim 11 or claim 12, wherein the organic phase containing cobalt and manganese is subjected to selective stripping to separate to a significant extent the cobalt from the manganese.
- 35 14. The process of claim 13, wherein the selective stripping comprises contacting the organic phase from the solvent extraction with an acidic aqueous solution to

yield (a) a loaded strip liquor containing manganese and (b) a selectively stripped organic solution containing cobalt.

5 15. The process of claim 14, wherein the acidic aqueous solution used in the selective stripping has a pH in the range of 4.0 to 5.0.

10 16. The process of any one of claims 1 to 10, wherein the leach solution contains cobalt and manganese, and the pH of the aqueous phase in the solvent extraction step is maintained in the range of from 3.5 to 5.0 to effect extraction of cobalt into the organic phase and rejection of manganese to the aqueous phase.

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17. The process of claim 16, wherein the cobalt is recovered from the organic phase by bulk stripping.

20 18. The process of any one of claims 1 to 17, wherein the leach solution comprises zinc and/or copper, the zinc and/or copper are extracted into the organic phase with the cobalt in the solvent extraction step, and the zinc and/or copper are separated from the cobalt by ion exchange.

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19. The process of any one of claims 1 to 10, wherein the leach solution comprises manganese and a low level or no cobalt, and the manganese is extracted into the organic phase to effect separation of manganese from the impurity elements calcium and/or magnesium.

30 20. The process of any one of claims 1 to 19, wherein scrubbing is conducted on the organic phase after each solvent extraction.

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21. A process for the separation of zinc, copper and cobalt from impurity elements selected from one or more of

manganese, calcium and magnesium contained in a leach solution, the process comprising the step of subjecting the leach solution to solvent extraction using an organic solution of a carboxylic acid and a hydroxyoxime.

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22. The process of claim 21, wherein the organic solution further comprises a stabilizer against hydroxyoxime degradation.

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23. A product recovered by the process according to any one of claims 1 to 22.